Method for Materials Processing by Means of Plasma-Inducing High-Energy Radiation

The invention relates to a method for materials processing by means of plasma-inducing high-energy radiation, especially laser radiation, in which the instantaneous intensity of the plasma radiation is measured at plural locations of a vapor capillary.

A method having the aforesaid features is known from DE 197 41 321 C1. In said method, instantaneous plasma intensities are measured parallel to the axis of the induced radiation at at least two measuring points. The measured plasma intensities are assigned to predetermined capillary geometry variables, i.e., for example, the depth of the vapor capillary, and control of the materials processing operation takes place as a function of these capillary geometry variables. This method utilizes a direct correlation between the observed plasma intensity and the formation of the vapor capillary to eliminate process errors by improved direct process monitoring. It has now been ascertained that said method is not applicable if the depth of the vapor capillary is comparable to its width. The analyzable relationship between plasma intensity and depth of penetration is no longer present.

By contrast, the object of the invention is to improve a method having the features cited in the introduction hereto in such a way that control of the materials processing operation can be influenced by direct process monitoring even when the depth of the plasma capillary is comparable to its width.

This object is accomplished in that shapes of two spaced-apart peak-intensity regions of the plasma radiation, or of another type of electromagnetic radiation emitted form the vapor capillary, and of a minimum region that can be formed between these two regions of extreme values are detected metrologically, in that metrologically detected shapes of the regions of extreme values are compared with predetermined region shapes, and in that control of the materials processing operation takes place as a function of deviations of the detected shapes from the predetermined region shapes.